Aalto University
School of Business

Financial Constraints and the Value of Cash During and After the Financial Crisis of 2008

Abstract

This thesis studies the impacts of the financial crisis of 2008 and its aftermath to the marginal value of cash for shareholders in the United States. The tests are conducted with the methodology of Faulkender & Wang (2006) with a total sample of 2679 firms and 25720 firm-years. This study adds to earlier literature by showing that the shareholders of an average firm value extra cash higher during the financial crisis due to more restricted access to debt, lower expectations of future income, increase in short-term debt and decrease in new equity issuance. After the crisis, the value of cash has since decreased below the levels of the pre-crisis period. I also find, that the cash is valued lower for constrained firms during the crisis due to lower investment activity and relatively higher debt and interest expenses. Unconstrained firms do not face similar changes and their cash is valued higher during the crisis period. The findings imply that these results for constrained and unconstrained firms are only temporary due to the crisis, as after the crisis the differences in value of cash between constrained and unconstrained firms present similar results with the earlier literature.

Bachelor's Thesis
Lauri Karjalainen
Aalto University School of Business
Finance
Fall 2018

Author Lauri Karjalainen

Title of thesis Financial Constraints and the Value of Cash During and After the Financial Crisis of 2008

Degree B.Sc.

Degree programme Finance

Thesis advisor(s) Bünyamin Önal

Year of approval yyyy **Number of pages** 29 **Language** English

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Keywords financial,constraints,value,of,cash,financial,crisis

Contents

1. Introduction **1**
2. Literature Review and Hypotheses Development **2**
3. Data and Methods **5**
3.1 Initial Data and Methods 5
3.2 The Dependent Variable 6
3.3 Independent Variables 6
3.4 The Financial Crisis 7
3.5 Financial Constraints 8
4. Results **9**
4.1 The Value of Cash for the Average U.S. Firm During the Crisis 9
4.2 The Value of Cash for the Average U.S. Firm After the I Crisis 10
4.3 The Value of Cash for Constrained and Unconstrained Firms During the Crisis 13
4.4 The Value of Cash for Constrained and Unconstrained Firms After the Crisis 14
5. Alternative Methods to Address Robustness **19**
6. Conclusion **23**
References **24**
Appendix **26**

1. Introduction

Sánchez & Yurdagul (2013) present two main reasons why firms hold on to cash: precautionary motives and repatriation taxes. The first reason includes the transactional motives; cash holdings provide flexibility for firms to take on to value-creating investments. Moreover, firms might hold cash as a buffer for future uncertainty and to issue debt with better terms. The second reason implies that firms might hold on to cash due to uncertainty in fiscal policies. They also cite Bates, Kahle & Stulz (2009) who present that the increase in cash holdings before the financial crisis have mostly related to precautionary motives.

Financial crisis of 2008 had large effects to the financial markets. Between 2008 and 2009, the S&P 500 index decreased 46% causing panic amongst investors. Furthermore, the increased failures of banks during the crisis led to tightened terms in loans and decrease in new debt issued. Thus, access to capital markets became more restricted between years 2007 and 2009. Following Acharya, Gujral, Kulkarni & Shin (2011) and Shleifer & Vishny (2010), I define the financial crisis to date between 2007 and 2009.

The existing literature contains multiple studies about the marginal value of cash for shareholders. This thesis contributes to the existing literature by examining the impact of financial crisis and its aftermath to the marginal value of corporate cash holdings for shareholders. Moreover, this paper studies the effects of the crisis on the marginal value of cash for the financially constrained and unconstrained firms. This thesis concentrates on firms from the United States. Corporate governance is also worth studying, but as it is beyond the scope of this thesis, I have not included corporate governance in this paper.

This thesis studies four different hypotheses. First, I study how the financial crisis affected the marginal value of cash. Second, I study how the marginal value of cash has changed after the financial crisis. The tests are conducted with linear regressions, with the first one containing 1869 firms and 13119 firm-years and the second containing 2677 firms and 20671 firm-years. Third, I move on to study a more specific occurrence; whether the financial crisis affected differently to financially constrained and unconstrained firms. Finally, I study if these differences are only temporary due to the crisis. I use similar methodology as in the first tests to study the last two hypotheses. I expect the marginal value of corporate cash for shareholders to increase in general during the financial crisis and then decrease below the levels of 2001-2006**.** Moreover, I expect that during an economic crisis, a dollar is valued

higher in an unconstrained firm than in a constrained firm. However, I expect this to be only temporary due to the financial crisis and therefore to return to the situation before the financial crisis. Finally, I repeat the tests replacing cash holdings with *excess* cash holdings to assign robustness.

After this introduction, my thesis is structured in the following sections. In the second section I review existing literature and develop my hypotheses. Third section presents the data and methods for my research. In the fourth section, I present the results for the methods and data. In the fifth section, I examine my results through alternative methods to assign robustness. Finally, I conclude the findings of my thesis in the sixth chapter.

2. Literature Review and Hypotheses Development

Michael Faulkender and Rong Wang discussed the value of corporate cash holdings for shareholders in their paper published in 2006. They find, that the rising cash levels and leverage decrease the marginal value of extra cash significantly. As a firm raises its debt, larger part of cash holdings are used to cover the interest expenses and debt reductions. Faulkender & Wang (2006), Denis & Sibilkov (2009) & Tong (2011) find that firms facing financial constraints have their extra cash holdings valued higher than firms without these constraints due to more difficulty in accessing external capital.

As argued in the Introduction section, access to capital markets became more restricted during the financial crisis. Ivashina & Scharfstein (2008) find a 37% decrease in new loans for large firms during the peak of financial crisis. Shleifer & Vishny (2010) also acknowledge the impaired access to debt markets during the financial crisis**.** Kahle & Stulz (2013) find that during the crisis new equity issuance decreased. If access to capital markets is restricted, firms might not be able to take on positive NPV investments as they might not find the needed funding. Moreover, firms had to rely more on their internal sources of funding. Rehman (1998) cites Greenwald & Stiglitz (1988), Bernanke & Gertler (1989) and Calomiris & Hubbard (1990) in his book Financial Crisis Management in Regional Blocs. They find that during a sharp decline in the stock market, the expectations of future income cash flows are lower. Furthermore, Harford, Klasa & Maxwell (2013) present in their study that the value of cash is higher for companies holding debt with shorter maturity. Fosberg (2013) finds that during the financial crisis, firms increase their short-term debt whereas long-term debt is seen more undesired.

Therefore, due to harder access to capital markets, increased short-term debt compared to long-term debt and the lower expectations of future income, the marginal value of cash should increase during time of economical crisis. Also, the panic caused by the financial crisis could have affected the shareholders to value extra cash higher due to precautionary and safety reasons.

Hypothesis 1: The marginal value of cash increases during the financial crisis

Pinkowitz, Stulz and Williamson (2013) find that after the financial crisis, an 87% increase in abnormal cash holdings has occurred compared to before the crisis. Indeed, in the data sample I used in this paper, the average cash-to -asset for the average firm has increased 31,5% from the start of my sample period to the end of my sample period**.** Moreover, David Stockman (2016) emphasizes the increase in corporate leverage. After the corporate leverage took a slight decrease during the financial crisis, in the recent years it has increased and bypassed the levels before the financial crisis. Also, Fosberg (2013) finds that firms from the United States increase their long-term debt issuance compared to short-term debt. Gutierrez & Philippon (2007) argue that there has been declining competition in the United States which has also led to lower investments. They show that the net investment of U.S. firms has not managed to grow on the levels before the financial crisis. Bates et al. (2009) present that the increase in cash holdings is mostly related to precautionary motives. If there are less value-creating investments in the future, the increase in the cash holdings should not be reasoned with transactional motives. Moreover, I see that the levels of cash holdings have risen over their optimal limits.

I argument that due to abnormal cash holdings, increased long-term debt and the lack of value-creating investment opportunities the marginal value of cash should decrease after the financial crisis compared to before the crisis. Also, due to increases in cash holdings and leverage and the findings of Faulkender & Wang (2006) presented in the beginning of this section, the difference in the value of cash between the mean firm and a firm with zero cash and no leverage should be higher than earlier.

Hypothesis 2: The marginal value of cash decreases after the financial crisis

As presented in the beginning of this section, multiple studies indicate that extra cash is valued higher for constrained firms than for unconstrained firms. Almeida, Campello and Weisbach (2004) emphasize that firms more likely to have financial constraints save a greater portion of their cash flow as cash. Consistently, Hadlock & Pierce (2010) find that firms with more cash are more likely to be constrained.

Campello, Graham and Harvey discuss the effects of financial crisis to financially constrained firm in their paper published in 2009. They find, that as constrained firms had inabilities to raise capital, financial crisis caused 86% of constrained firms to bypass attractive investments during the crisis. However, due to increase in cash holdings, I argument that the investments were bypassed due to precautionary and safety motives of cash holdings and not due to the lack of capital resulting from harder access to capital markets. Also, Kim & Park (2015) find that the KZ index, which captures the distress aspect of constrained firms, indicates that constrained firms reduce debt rather than invest the extra cash to value-creating projects. During the financial crisis, the distressed firms use a larger part of their cash holdings to cover debt and interest expense than before the crisis. Even though financial constraints do not necessarily indicate vulnerability to distress, I argument that the shareholders of constrained firms expect larger part of cash holdings to be used to cover debt and interest expense leading to a wealth transfer between shareholders and debtholders. With the reasons presented above, I expect that the value of cash should decrease for firms facing financial constraints during the financial crisis.

Ivashina & Scharfstein (2008) examined the impact of bank lending during the financial crisis. They find, that new loans fell by 37% to large firms during the peak period of financial crisis. As Hadlock & Pierce (2010) argue, size is an important factor to measure constraints. Thus, as large firms did not have to cut on feasible investments as harshly as smaller firms, the value of marginal cash should increase for unconstrained firms during the crisis. Combining the arguments for constrained and unconstrained firms, I believe that my findings are contrary to the previous findings in the existing literature which do not include the crisis period.

Hypothesis 3: The differences between the value of cash in constrained and unconstrained firms during the crisis is contrary compared to before the crisis

As Almeida et al. (2004) present, the financially constrained firms face more cuts on investments than unconstrained firms during the crisis. The effects of an economic crisis are therefore different for constrained and unconstrained firms. As the markets calm down and the crisis is conquered, the effects of having financial constraints should return to original levels. Constrained firms have lower incentive to hold on to cash as future is not as uncertain, they can take on attractive investments and lesser portion of cash holdings is used to cover debt and interest expense. As the bank lending increases after

the crisis period, the unconstrained firms have easier access to external capital leading to lower value of extra cash.

Hypothesis 4: After the financial crisis the value of cash for constrained and unconstrained firms returns to the levels before the crisis.

3. Data and Methods

3.1 Initial Data and Methods

In this thesis, I use COMPUSTAT as the source of firm-level data. I use CRSP for the stock returns data. The data is for all listed companies in the United States from New York Stock Exchange, American Stock Exchange, NASDAQ-NMS Stock Market, Boston Stock Exchange, Midwest Stock Exchange, Pacific Exchange and Philadelphia Exchange. The sample period in this paper is from 2001 to 2015. All firm-years contain 12-month fiscal-year end data for the respective firm. Benchmark portfolio returns are from Kenneth. R. French's web page.

Following earlier literature (e.g. Tong, 2007) I exclude all financial firms (SIC codes between 6000 and 6999) and utility firms (SIC codes between 4900 and 4999). I also exclude all firm-years with missing financial information**.** As the variables measure the changes of certain characteristics and are scaled with the 1-year lagged market value of equity, I also exclude all firm-years which do not have data for year t-1. Also, following Faulkender & Wang's (2006) paper on the marginal value of cash, firm-years with negative net assets, negative market value of equity or negative dividends are excluded from this paper**.** After this, I trim the bottom and top 1% tails of firm-specific factors and left-hand side variable using the full sample to avoid distortions and outliers in the data. Finally, after the exclusions my sample contains 2679 firms with 25720 firm-year observations.

In this paper, I follow the methods of Faulkender & Wang (2006) for measuring the marginal value of cash holdings. My baseline regression is as follows:

$$R_{i,t} - RB_{i,t} = a + b_1 * \frac{\Delta C_{i,t}}{M_{i,t-1}} + b_2 * \frac{\Delta E_{i,t}}{M_{i,t-1}} + b_3 * \frac{\Delta NA_{i,t}}{M_{i,t-1}} + b_4 * \frac{\Delta R\&D_{i,t}}{M_{i,t-1}} + b_5 * \frac{\Delta I_{i,t}}{M_{i,t-1}} + b_6 * \frac{\Delta D_{i,t}}{M_{i,t-1}} + b_7 * \frac{C_{i,t-1}}{M_{i,t-1}} + b_8 * L_{i,t} + b_9 * \frac{NF_{i,t}}{M_{i,t-1}} + b_{10} * \frac{\Delta C_{i,t}}{M_{i,t-1}} * \frac{C_{i,t-1}}{M_{i,t-1}} + b_{11} * L_{i,t} \frac{\Delta C_{i,t}}{M_{i,t-1}} + \varepsilon_{i,t}$$

Each variable is conducted for each firm *i* for each firm-year *t*. This regression essentially represents a long-run event study. I interpret the regression results as the marginal value of an extra dollar for shareholders.

3.2 The Dependent Variable

Throughout my paper, I use excess stock returns ($R_{i,t}$ - $RB_{i,t}$) for the firm *i* during fiscal year *t* as the left-hand side variable in my regressions. $R_{i,t}$ is defined as the stock i's return over fiscal year t-1 to t. Stock returns are from CRSP tapes. I use the 25 Fama and French portfolios as the benchmark portfolios. The benchmark portfolios are formed by size and book-to-market and are computed to represent the 12-month value-weighted return at the end of each fiscal year. For each year, all firms are grouped into one of the benchmark portfolios based on the intersection between size and book-to-market. As these benchmark portfolios are originally grouped from New York Stock Exchange (NYSE), I first group all stocks from the respective stock exchange into 5 size and 5 market-to-book groups. To avoid grouping firms from different stock exchanges into wrong groups, the breakpoints of the NYSE quintiles are used to assign the firm-year to the right group. The excess return is then simply conducted by subtracting the return of the benchmark portfolio from the realized return of the stock.

3.3 Independent Variables

Following earlier literature, I first define the unexpected change in variable X (ΔX) as the realized change. All independent variables except the leverage are scaled with the 1-year lagged market value of equity of firm *i* ($M_{i,t-1}$). According to Faulkender & Wang, (2006) these deflations are conducted to avoid the largest firms dominate the results**.** Market value of equity is defined as the number of shares times the stocks's closing price at the end of fiscal-year. $C_{i,t}$ is cash holdings defined as cash and short-term investments. $E_{i,t}$ is earnings defined as earnings before extraordinary items. $NA_{i,t}$ is net assets defined as total assets minus cash holdings. $R\&D_{i,t}$ is research and development expense. $I_{i,t}$ is total interest and related expense. $D_{i,t}$ is Dividends Common/Ordinary. $C_{i,t-1}$ is the 1-year lagged cash and short-term investments. $L_{i,t}$ is market leverage defined as total debt over the sum of total debt and

market value of equity. $NF_{i,t}$ is new financing defined as the sum of common and preferred stock sold and long-term debt issuance minus the sum of purchase of common and preferred stock and reduction of long-term debt. Two interaction terms are included in the baseline regression. First one, $\frac{\Delta C_{i,t}}{M_{i,t-1}} * \frac{C_{i,t-1}}{M_{i,t-1}}$, is included to capture the effects of changes in the marginal value of cash holdings for different levels of cash holdings. Second one, $L_{i,t} \frac{\Delta C_{i,t}}{M_{i,t-1}}$, is included to capture the effects of changes in the marginal value of cash for different levels of leverage. More about the variables are presented in Appendix.

3.4 The Financial Crisis

As this paper examines how the value of an extra dollar for shareholders has changed during and after the financial crisis, I define the whole sample period into three sub-periods. Acharya et al. (2011) defines the crisis period from 2007 to 2009. Therefore, I create a dummy variable that equals 1 if firm-year is 2007 or after and 0 if the firm-year is before 2007. As I expect the marginal value of cash to increase during the financial crisis period and decrease after the crisis, I also introduce a second dummy variable. After Financial Crisis is a dummy variable that equals 1 if the observation dates on 2010 or later and 0 if the observation dates on 2006 or earlier. These periods are tested in two separate regressions. First one includes the period before the financial crisis and during financial crisis. The second one includes the period before the financial crisis and after the financial crisis. Therefore, in this second regression, the firm-years between 2007 and 2009 are excluded.

Moreover, I include an interaction dummy for both dummy variables presented above to present the interaction between the periods and the change in cash holdings. Financial Crisis * ΔCash Holdings is included in the first regression to examine the changes in the marginal value of cash for shareholders before the financial crisis and during the financial crisis. In the second regression, the interaction term After Financial Crisis * ΔCash Holdings examines the same effect before the crisis and after the crisis. Both dummy variables are included in the respective regressions to ensure that the estimated coefficient of interaction terms are due to the interaction and not due to crisis or its aftermath itself.

3.5 Financial Constraints

To test the third and fourth hypotheses, I analyze the firms that are measured to have differing financial constraints than others. I study the effects of financial crisis in two different regressions. First one includes firm-years before the financial crisis and during the financial crisis. The second one includes firm-years during and after the financial crisis. Hadlock & Pierce (2010) discuss criteria for financial constraints in their paper "New evidence on Measuring Financial Constraints: Moving Beyond the KZ Index". They find that many of the widely used indexes and variables to determine financial constraints correlate poorly with actual constraints. Hadlock & Pierce (2010) suggest that researchers should rely solely on two exogenous characteristics: firm size and age. Differing from earlier literature (e.g. Denis & Sibilkov, 2010 and Faulkender & Wang, 2006), I do not study the financial constraints for firms through payout policy or bond rating variables as Hadlock & Pierce (2010) find them to be insignificant if age and size are controlled. Two alternative schemes are presented below.

1. *Size*: Large firms are more likely to be have fewer financial constraints, as they are better known and tend to have easier access to capital markets. Consistent with Hadlock & Pierce (2010), size is measured with the logarithm of total assets. For each year all firm-years are ranked by the fiscal-year end logarithm of total assets. Finally, I assign the firm-years into unconstrained (constrained) groups whose size is greater (less) than or equal to the logarithm of total assets in the top (bottom) three deciles of annual size group.
2. *Age*: Carreira & Silva (2012) argue that older firms have more information available to potential lenders than younger firms. This leads younger firms to face more financial constraints. In this paper, I define age as the years the company has been public. For each firm-year, I subtract the year for which the initial public offering (IPO) dates from the year of the observation. Similar to the previous paragraph, I assign the firm-years to the unconstrained (constrained) groups whose age is more (less) than or equal to the age in the top (bottom) three deciles.

These hypotheses are essentially tested with sub-samples, because only three bottom and top deciles are assigned into groups of unconstrained and constrained firms. To test the effects of the financial crisis and the changes in the marginal value of cash, I introduce a triple interaction term Financial Crisis * Constrained * ΔCash Holdings. This presents the different effect of the crisis to constrained firm's value of extra dollar compared to unconstrained firm. The Constrained variable is a dummy variable

that equals 1 if the firm is distinguished as a firm with financial constraints and 0 if the firm is distinguished as financially unconstrained firm. The dummy is also included as a separate variable in the regressions. Another interaction term, Constrained * ΔCash Holdings is included in the regression to present the difference of an extra dollar for the constrained and unconstrained firm before the start of financial crisis. Finally, the interaction term Financial Crisis * Constrained is introduced to the regressions. All other variables and interaction terms presented in the baseline regression and sections 3,.2 & 3.3 are also included. To test the changes after the financial crisis, the Financial Crisis dummy is replaced with After Financial Crisis dummy. All other above variables remain the same.

4. Results

In this section, I report the results for the regressions. First, I examine how the value of cash has changed for the mean firm in the U.S. during the financial crisis and after the financial crisis compared to before the crisis. Subsequently, I examine how the marginal value of cash has changed for the constrained and unconstrained firms during the financial crisis and after the financial crisis**.** Sections 4.1, 4.2, 4.3 and 4.4 examine all four hypotheses presented earlier, respectively.

The main objective of my thesis is to examine the impact of financial crisis to the marginal value of a dollar for the shareholders. Following earlier literature, an extra dollar in cash is expected to affect the firm's excess return through the change in cash holdings and the interaction terms.

I use the following formula to conduct the marginal value of an extra dollar to shareholders:

$$= \Delta Cash + (Cash_{Inter}\ X\ Mean\ Cash) + (Leverage_{Inter}\ X\ Mean\ Leverage)$$

Where $\Delta\mathrm{Cash}$ is the change in Cash Holdings presented in the regression results. $\mathrm{Cash}_{\mathrm{inter}}$ is the coefficient of the interaction term ΔCash Holdings * $\mathrm{Cash\ Holdings}_{\mathrm{t\text{-}1}}$ and $\mathrm{Leverage}_{\mathrm{inter}}$ is the coefficient of the interaction term Leverage * ΔCash Holdings. Mean cash is the mean Cash Holdings of the sample presented in the summary statistic tables. Mean leverage is also presented in the summary statistics.

4.1 The Value of Cash for the Average U.S. Firm During the Crisis

To test whether the marginal value of cash has changed during the financial crisis, I use the summary statistics presented in Table 1 columns 3 and 4 and the regression results presented in Table 2 columns 2 and 3. Consistent with Faulkender & Wang (2006), I find that increase in leverage and cash holdings

does decrease the marginal value of cash for shareholders. This is indicated by the negative coefficients of the interaction terms. I find that before the financial crisis, the marginal value of an extra dollar is 1,271$ for a firm with zero debt and zero cash holdings. Moreover, the positive coefficient (0,126) of the interaction term Financial Crisis * ΔCash Holdings indicates that during the financial crisis an extra dollar is worth 12,6 cents more if the other characteristics remain on the same levels. The coefficient is significant at 5% level. With the summary statistics of Table 1 column 2 and 3 I find that during the financial crisis, the cash levels and leverage have increased. Combining the means of Table 1 and coefficients of Table 2, I conclude that before the financial crisis the marginal value of an extra dollar for the mean firm is valued at $1,17 (= 1,271 + (-0,284 * 0,155) + (-0,649 * 0,168) by the shareholders. During the crisis the marginal value of an extra dollar for the mean firm is $1,21 (=1,271 + 0,126 + (-0,284 * 0,192) + (-0,649 * 0,206). The coefficients of the two interaction terms used in the calculations are both significant at 1%. These results are consistent with the first hypothesis. As emphasized in section 2, I argument this to be the result of the more restricted access to capital markets during the financial crisis, the increase in short-term debt and lower expectations of future income streams.

4.2 The Value of Cash for the Average U.S. Firm After the Crisis

Moving on to examine the second hypothesis I use the same two tables for the summary statistics and regression results as in the previous section. From the third column of Table 2, I present that during year 2010-2015, the marginal value of cash has decreased for a firm with zero debt and zero cash holdings. Note, that the negative coefficient (-0,193) of the interaction term After Financial Crisis * ΔCash Holdings indicates that the marginal value of cash after the financial crisis is valued 19,3 cents lower than *before* the financial crisis. The coefficient is significant at 1% level. Likewise, the interaction terms are also both significant at 1% level. For the average firm, the shareholders value an extra dollar at only $0,89 (=1,28 + (-0,193) + (-0,323 * 0,196) + (-0,694 * 0,190) after the financial crisis. These results are consistent with my second hypothesis.

From Table 1 column 4 it is noteworthy to emphasize the mean of 1-year lag of cash holdings and leverage of the after financial crisis period. There is an increase in the variables compared to column 2 which presents the respective variables for the period 2001-2006. Consistent with the findings of Faulkender & Wang (2006) it is reasonable to argue that the increase in cash holdings and leverage do have a negative impact for the marginal value of cash. I argument, that the decrease in the marginal

value of cash is partly due to the abnormal cash holdings held by the firms, which Pinkowitz et al. (2013) also point out. Also, as shown in Table 1, an average U.S. public company has nearly doubled their New Financing after the crisis compared to the period before the crisis. As there are not significant changes in research and development activity or net assets, I argue that these companies are hoarding cash which is not relevant for their investment activity. Therefore, I suggest that shareholders see the firms piling on excess cash and thus, not valuing additional corporate cash holdings as high as before the financial crisis. Also, as suggested earlier, short-term debt decreases after the crisis leading to lower value of cash holdings.

Table 1

Table 1 presents the summary statistics for 3 different sample periods**.** Columns named (B) are statistics for the sample period before the financial crisis from 2001 to 2006. Columns named (F) are statistics for the sample period during the financial crisis 2007-2009. Columns named (A) are statistics for the sample period after the financial crisis 2010-2015. All of the variables, except $R_{i,t}$, Excess Return and leverage are scaled by the 1-year lagged market value of equity. Details on the variables are presented in section 3.2 and Appendix.

Independent variable	Mean			Median			1st Quartile			3rd Quartile			Std. Dev.		
	(B)	(F)	(A)	(B)	(F)	(A)	(B)	(F)	(A)	(B)	(F)	(A)	(B)	(F)	(A)
$R_{i,t}$	0,230	0,099	0,137	0,133	-0,020	0,082	-0,105	-0,377	-0,157	0,419	0,378	0,337	0,594	0,713	0,504
Excess return	0,093	0,111	0,004	0,005	-0,003	-0,042	-0,232	-0,241	-0,259	0,282	0,283	0,174	0,559	0,586	0,460
ΔCash Holdings	0,018	0,017	0,010	0,007	0,005	0,002	-0,015	-0,023	-0,028	0,044	0,044	0,037	0,135	0,184	0,145
$\text{Cash Holdings}_{t-1}$	0,155	0,192	0,196	0,082	0,102	0,123	0,031	0,040	0,053	0,182	0,231	0,248	0,237	0,289	0,253
ΔEarnings	0,027	0,026	0,009	0,008	0,001	0,004	-0,014	-0,038	-0,022	0,035	0,025	0,031	0,297	0,464	0,305
ΔNet Assets	0,057	-0,003	0,060	0,034	0,015	0,024	-0,015	-0,058	-0,023	0,119	0,092	0,103	0,431	0,477	0,493
ΔR&D	0,000	-0,003	0,001	0,000	0,000	0,000	0,000	0,000	0,000	0,002	0,001	0,002	0,035	0,048	0,034
ΔInterest Expenses	-0,001	-0,001	0,001	0,000	0,000	0,000	-0,002	-0,002	-0,001	0,001	0,002	0,001	0,027	0,036	0,026
ΔDividends	0,001	-0,002	0,001	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,001	0,001	0,026	0,044	0,035
Leverage	0,168	0,206	0,190	0,112	0,131	0,126	0,010	0,008	0,006	0,257	0,320	0,291	0,188	0,228	0,210
New Financing	0,022	0,014	0,043	0,000	-0,002	0,000	-0,032	-0,041	-0,029	0,034	0,024	0,050	0,210	0,235	0,235
Observations	8071	5048	12601	8071	5048	12601	8071	5048	12601	8071	5048	12601	8071	5048	12601

Table 2

This table presents the regression results for 2 different regressions. Columns 2 and 3 present the coefficients and p-values for the sample period 2001-2009 which examines the impacts of financial crisis to the marginal value of cash. Columns 4 and 5 present the coefficients and p-values for the sample periods 2001-2006 & 2010-2015. The first regression includes 1869 firms and 13119 firm-years and the second includes 2677 firms and 20671 firm-years. The dependent variable is Excess Return defined as $R_{i,t} - RB_{i,t}$. Financial Crisis is a dummy variable that equals 1 if the observation dates between years 2007-2009 and 0 if the observation dates between years 2001-2006. After Financial Crisis is a dummy variable that equals 1 if the observation dates between 2010-2015 and 0 if the observation dates between years 2001-2006. All of the variables, except leverage and the dummy variables, are scaled by the 1-year lagged market value of equity. Details on the variables are presented in section 3.2 and Appendix. A P-value of 0,000 presents that the p-value is significant at 0,05% or lower.

	I		II	
	Coef.	*P-value*	*Coef.*	*P-value*
Intercept	0,061	0,000	0,074	0,000
ΔCash Holdings	1,271	0,000	1,280	0,000
Financial Crisis	0,027	0,004		
Financial Crisis * ΔCash Holdings	0,126	0,028		
After Financial Crisis			-0,068	0,000
After Financial Crisis * ΔCash Holdings			-0,193	0,000
ΔEarnings	0,257	0,000	0,205	0,000
ΔNet Assets	0,141	0,000	0,125	0,000
ΔR&D	-0,309	0,006	0,073	0,441
ΔInterest Expenses	-0,716	0,000	-0,619	0,000
ΔDividends	-0,197	0,133	0,450	0,000
Leverage	-0,397	0,000	-0,352	0,000
Cash Holdings$_{t-1}$	0,386	0,000	0,258	0,000
New Financing	-0,122	0,000	-0,139	0,000
ΔCash Holdings * Cash Holdings$_{t-1}$	-0,284	0,000	-0,323	0,000
ΔCash Holdings * Leverage	-0,649	0,000	-0,694	0,000
Observations	13119		20671	
Adjusted R^2	0,139		0,105	

4.3 The Value of Cash for Constrained and Unconstrained Firms During the Crisis

To test the third hypothesis; whether the shareholders' value extra cash differently for financially constrained and unconstrained firms due to the crisis, I present the regression results and summary statistics for financially unconstrained and constrained firms in this section. I have conducted separate regressions for both the size and age criteria for financial constraints. I present them in table 5. Second and fourth column presents the coefficients and p-values for firms grouped by their size and the sixth and eighth column presents the results for firms grouped by their age, respectively. Moreover, I present the summary statistics for firms distinguished as financially unconstrained in table 3 and for constrained firms in table 4. The summary statistics combine the respective statistics of age and size grouped deciles by taking the mean of these two. The reason for this is the closely similar results of both individual summary statistics.

Summary statistic tables for both constrained and unconstrained firms show an increase in the 1-year lag of cash holdings during the crisis compared to before the crisis. However, contrary to constrained firms, unconstrained firms increase their cash holdings even after the financial crisis.

Consistent with the results of section 4.1, the coefficients Financial Crisis * ΔCash Holdings shows a positive impact of Financial Crisis to the marginal value of cash in both regressions significant at 1% level. Consistent with the results of Faulkender & Wang (2006), before the financial crisis the interaction term Constrained * ΔCash Holdings indicates a positive premium for firms with financial constraints. However, the indicated coefficient in the size regression is not significant contrary to the positive coefficient of 0,329 in the age regression which is significant at 1% level.

Both the age and size regressions indicate a strong negative impact of the triple interaction term Financial Crisis * Constrained * ΔCash Holdings for constrained firm. In the size-regression this coefficient implies that for constrained firms, extra cash is valued 69 cents less during the financial crisis. This coefficient is significant at 1% level. The age-regression implies a lesser impact; cash is valued 30,8 cents less with significance at 5% level. However, combined with the positive coefficients of Financial Crisis * ΔCash Holdings I find that during the financial crisis, the marginal value of cash for constrained firm is still above its book value. Combining the summary statistics with the regression results, I find that for the average constrained firm, an extra dollar is worth *$1,22* (=1,25 + 0,076 + (-0,225*0,221) + (-0,432 * 0,125)) before the crisis and *$1,08* (=1,25 + 0,076 + (-0,69) + 0,57 + (-0,225 * 0,253)+(-0,432 *

0,158)) during the crisis if grouped by size. The corresponding values are $*1,20* and $*1,24* if grouped by age**.**

For a firm that is distinguished as unconstrained, the marginal value of cash is $1,13 (=1,250 + (-0,225 * 0,122) + (-0,432 * 0,216)) before the crisis and $1.68 during the crisis if grouped by size. The respective values are $0,86 and $1.39 if grouped by age.

The subtraction of interaction terms Constrained * ΔCash Holdings and Financial Crisis * Constrained * ΔCash Holdings presents the difference between the marginal value of cash in financially constrained and unconstrained firms, if the baseline is the period during the financial crisis. Therefore, a constrained firm's extra dollar is valued $0,61 dollars less than unconstrained firm's extra dollar if grouped by size.

To conclude this sub-section, the marginal value of cash has increased for the unconstrained firms with mostly significant results. However, the results suggest that for constrained firms the increase in the value of cash has been modest or even negative during the financial crisis. I argue that the large difference between the value of cash between these companies are the results of the constrained firms need to postpone investments and their vulnerability to distress. As the investments were not postponed due to lack of capital, an extra dollar is valued lower for constrained firms in the time of crisis. Also, as the constrained firms are more vulnerable to distress, larger part of incoming cash was believed to be used to cover debt and interest expense. Therefore, I argument that an extra dollar for a constrained firm was not as valuable as for unconstrained firms during the crisis.

4.4 *The Value of Cash for Constrained and Unconstrained Firms After the Crisis*

This sub-section presents the results of changes in the value of cash for financially constrained and unconstrained firms after the financial crisis. The previous sub-section emphasized that an extra dollar is valued higher if the firm is financially unconstrained during the financial crisis. To test whether this is just due to the crisis and not a permanent change, I examine the value of cash for unconstrained and constrained firms after the financial crisis compared to during the financial crisis. Thus, the After Financial Crisis dummy equals 1 if the observation dates to or after 2010 and 0 if the observation dates before 2010. All interaction terms in the previous sub-section containing the dummy Financial Crisis are replaced with the After Financial Crisis dummy. The summary statistics are presented in Tables 4 and 5, similarly to previous section. The regression results are presented in Table 6.

In table 6, columns 2 and 4 I find that the interaction term ΔCash Holdings * Cash Holdings$_{t-1}$ is not significant at 10% level in the size regression, which might give a slight distortion to the results for the marginal value of cash for the *mean* firm. However, all the needed coefficients to examine the relative changes are significant at 1 % level. Thus, I present significant results for a firm with no debt and zero cash holdings. Moreover, as the regression results for the age group shows few insignificancies in the variables in the After Financial Crisis interaction terms, I focus on the size group in this section.

Consistent with the results of sections 4.1 and 4.2 a dollar is valued 68,7 cents less after the financial crisis compared to during the financial crisis. The highly negative coefficient of the interaction term Constrained * ΔCash Holdings$_{t-1}$ presents that during the financial crisis, firms with financial constraints have a lower value for an extra dollar. However, the triple interaction term After Financial Crisis * Constrained * ΔCash Holdings suggests, that after the crisis the equity market places a premium for an extra dollar in constrained firms. Considering an unconstrained firm with zero cash holdings and no debt, the marginal value of a dollar is $1,549 during the financial crisis and $0,86 (=1,549 + (-0,687)) after the financial crisis. The respective values for a constrained firm are $0,88 (=1,549 +(-0,079) + (-0,591)) during the crisis and $1,153 after the crisis**.** These results are consistent with the fourth hypothesis and the changes in the value of cash for constrained and unconstrained firms during the crisis are only temporary. This is consistent with the findings of Faulkender & Wang (2006), Denis & Sibilkov (2009) and Tong (2011). After the financial crisis, the shareholders of constrained firms place a premium for an extra dollar contrary to shareholders of unconstrained firms.

Table 3

This table presents the summary statistics of each variable for firms distinguished as financially unconstrained. This table merges both size and age grouped unconstrained firms' summary statistic by taking the mean of the respective statistics. Columns with the header (B) presents the statistics for firms before the financial crisis 2001-2006. Columns with the headers (F) and (A) presents the respective statistics for firms during the financial crisis 2007-2009 and after the financial crisis 2010-2015, respectively. All the variables, except $R_{i,t}$, Excess Return and leverage are scaled by the 1-year lagged market value of equity. Details on the variables are presented in section 3.2, section 3.5 and Appendix.

Unconstrained															
Independent variables	Mean			Median			1st Quartile			3rd Quartile			Std. Dev.		
	(B)	(F)	(A)	(B)	(F)	(A)	(B)	(F)	(A)	(B)	(F)	(A)	(B)	(F)	(A)
$R_{i,t}$	0,186	0,093	0,132	0,130	0,017	0,107	-0,056	-0,310	-0,093	0,353	0,350	0,306	0,415	0,653	0,354
Excess return	0,074	0,117	-0,001	0,021	0,035	-0,021	-0,156	-0,157	-0,194	0,229	0,257	0,148	0,391	0,516	0,318
ΔCash Holdings	0,019	0,024	0,006	0,007	0,006	0,001	-0,010	-0,012	-0,020	0,038	0,040	0,027	0,102	0,131	0,092
Cash Holdings$_{t-1}$	0,122	0,147	0,160	0,061	0,075	0,098	0,026	0,032	0,042	0,134	0,167	0,201	0,199	0,260	0,197
ΔEarnings	0,015	0,007	0,006	0,008	0,002	0,005	-0,012	-0,037	-0,015	0,031	0,021	0,026	0,272	0,363	0,221
ΔNet Assets	0,076	0,014	0,063	0,037	0,020	0,027	-0,013	-0,056	-0,023	0,125	0,092	0,104	0,435	0,490	0,545
ΔR&D	0,001	-0,001	0,001	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,000	0,001	0,014	0,020	0,008
ΔInterest Expenses	0,000	0,000	0,001	0,000	0,000	0,000	-0,002	-0,002	-0,001	0,002	0,002	0,002	0,020	0,037	0,024
ΔDividends	0,001	-0,002	0,001	0,000	0,000	0,000	0,000	0,000	0,000	0,002	0,002	0,002	0,032	0,045	0,036
Leverage	0,216	0,244	0,235	0,171	0,187	0,191	0,080	0,082	0,087	0,306	0,351	0,330	0,187	0,221	0,205
New Financing	0,007	0,005	0,017	-0,008	-0,008	-0,007	-0,043	-0,046	-0,040	0,024	0,024	0,027	0,179	0,215	0,216

Table 4

This table presents the summary statistics of each variable for firms distinguished with financial constraints. This table merges both size and age grouped unconstrained firms summary statistics by taking the mean of the respective statistics. Columns with the header (B) presents the statistics for firms before the financial crisis 2001-2006. Columnswith the headers (F) and (A) presents the respective statistics for firms during the financial crisis 2007-2009 and after the financial crisis 2010-2015, respectively. All the variables, except $R_{i,t}$, Excess Return and leverage are scaled by the 1-year lagged market value of equity. Details on the variables are presented in section 3.2, section 3.5 and Appendix.

Constrained															
Independent variables	Mean			Median			1st Quartile			3rd Quartile			Std. Dev.		
	(B)	(F)	(A)	(B)	(F)	(A)	(B)	(F)	(A)	(B)	(F)	(A)	(B)	(F)	(A)
$R_{i,t}$	0,263	0,120	0,128	0,120	-0,061	0,018	-0,187	-0,460	-0,291	0,509	0,437	0,379	0,735	0,832	0,654
Excess return	0,101	0,138	0,020	-0,037	-0,040	-0,088	-0,331	-0,307	-0,350	0,346	0,353	0,227	0,687	0,699	0,593
ΔCash Holdings	0,014	0,009	0,011	0,007	0,002	0,002	-0,029	-0,045	-0,043	0,053	0,047	0,051	0,163	0,228	0,192
Cash Holdings$_{t-1}$	0,211	0,253	0,245	0,125	0,154	0,160	0,050	0,059	0,072	0,258	0,318	0,313	0,285	0,333	0,287
ΔEarnings	0,044	0,050	0,015	0,009	0,001	0,002	-0,023	-0,041	-0,039	0,043	0,034	0,039	0,386	0,530	0,390
ΔNet Assets	0,029	-0,001	0,039	0,021	0,015	0,017	-0,028	-0,052	-0,030	0,106	0,096	0,097	0,450	0,523	0,534
ΔR&D	-0,002	-0,007	0,001	0,000	0,000	0,000	0,000	0,000	0,000	0,004	0,003	0,005	0,055	0,071	0,055
ΔInterest Expenses	-0,001	-0,001	0,000	0,000	0,000	0,000	-0,001	-0,001	-0,001	0,001	0,001	0,001	0,032	0,046	0,034
ΔDividends	0,001	-0,001	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,027	0,046	0,043
Leverage	0,125	0,158	0,150	0,039	0,051	0,058	0,000	0,000	0,000	0,188	0,244	0,228	0,182	0,221	0,203
New Financing	0,039	0,032	0,073	0,003	0,000	0,003	-0,016	-0,026	-0,014	0,053	0,042	0,095	0,222	0,279	0,269

Table 5

This table presents the regression results for financially unconstrained and financially constrained firms before and during the financial crisis. Therefore, the sample period is 2001-2009. Columns 2 and 4 presents the coefficients and p-values for the independent variables if the firm is distinguished as constrained/unconstrained by the size of the firm. Columns 6 and 8 presents the respective values for constrained and unconstrained firms distinguished by the age of the firm. The dependent variable is Excess Return defined as $R_{i,t} - RB_{i,t}$. Financial crisis is a dummy variable that equals 1 if the observation dates to or after 2007 and 0 if observation dates before 2007. The first regression includes 1321 firms and 7882 firm-years and the second includes 1307 firms and 8289 firm-years. All the variables, except leverage and the dummy variables, are scaled by the 1-year lagged market value of equity. A P-value of 0,000 presents that the p-value is significant at 0,05 % or lower. More about the variables in section 3.2, section 3.5 and Appendix.

	Size		Age	
	Coef.	*P-value*	*Coef.*	*P-value*
Intercept	0,081	0,000	0,050	0,000
ΔCash Holdings	1,250	0,000	0,974	0,000
Financial Crisis	0,048	0,010	0,018	0,296
Constrained	-0,072	0,000	-0,018	0,227
Financial Crisis * Constrained	-0,032	0,223	0,034	0,157
Constrained * ΔCash Holdings	0,076	0,591	0,329	0,004
Financial Crisis * Constrained * ΔCash Holdings	-0,690	0,000	-0,308	0,048
Financial Crisis * ΔCash Holdings	0,570	0,000	0,382	0,002
ΔEarnings	0,204	0,000	0,243	0,000
ΔNet Assets	0,124	0,000	0,123	0,000
ΔR&D	-0,456	0,001	-0,203	0,165
ΔInterest Expenses	-0,549	0,005	-0,374	0,059
ΔDividends	-0,204	0,277	-0,265	0,095
Leverage	-0,360	0,000	-0,302	0,000
Cash Holdings$_{t-1}$	0,463	0,000	0,376	0,000
New Financing	-0,135	0,000	-0,081	0,010
ΔCash Holdings * Cash Holdings$_{t-1}$	-0,225	0,000	-0,311	0,000
ΔCash Holdings * Leverage	-0,432	0,009	-0,316	0,017
Observations	7882		8289	
Adjusted R^2	0,151		0,147	

Table 6

This table presents the regression results for financially unconstrained and financially constrained firms during and after the financial crisis. Therefore, the sample period is 2007-2015. Columns 2 and 4 presents the coefficients and p-values for the independent variables if the firm is distinguished as constrained/unconstrained by the size of the firm. Columns 6 and 8 presents the respective values for constrained and unconstrained firms distinguished by the age of the firm. The dependent variable is Excess Return defined as $R_{i,t} - RB_{i,t}$. After Financial crisis is a dummy variable that equals 1 if the observation dates to or after 2010 and 0 if observation dates before 2010. The first regression includes 1899 firms and 10596 firm-years and the second includes 2290 firms and 11138 firm-years. All the variables, except leverage and the dummy variables, are scaled by the 1-year lagged market value of equity. A P-value of 0,000 presents that the p-value is significant at 0,05 % or lower. More about the variables in section 3.2, section 3.5 and Appendix.

	Size		Age	
	Coef.	*P-value*	*Coef.*	*P-value*
Intercept	0,154	0,000	0,098	0,000
ΔCash Holdings	1,549	0,000	1,375	0,000
After Financial Crisis	-0,128	0,000	-0,074	0,000
Constrained	-0,079	0,000	0,024	0,151
After Financial Crisis * Constrained	0,008	0,606	-0,061	0,002
Constrained * ΔCash Holdings	-0,591	0,000	-0,055	0,575
After Financial Crisis * Constrained * ΔCash Holdings	0,953	0,000	0,136	0,279
After Financial Crisis * ΔCash Holdings	-0,687	0,000	-0,465	0,000
ΔEarnings	0,141	0,000	0,184	0,000
ΔNet Assets	0,072	0,000	0,097	0,000
ΔR&D	-0,452	0,000	-0,289	0,015
ΔInterest Expenses	0,251	0,027	0,325	0,025
ΔDividends	-0,119	0,171	0,051	0,659
Leverage	-0,338	0,000	-0,382	0,000
Cash Holdings$_{t-1}$	0,305	0,000	0,302	0,000
New Financing	-0,060	0,000	-0,085	0,000
ΔCash Holdings * Cash Holdings$_{t-1}$	-0,012	0,714	-0,193	0,000
ΔCash Holdings * Leverage	-0,546	0,000	-0,595	0,000
Observations	10596		11138	
Adjusted R^2	0,558		0,155	

5. Alternative Methods to Address Robustness

So far, my regressions have studied how market reacts to the unexpected changes in cash holdings. In this section, I repeat my analysis using the change in *excess* cash holdings instead of change in cash holdings as Faulkender & Wang (2006) show that the benchmark return should already reflect the average increase in cash holdings. In this paper, I follow the methods of Faulkender & Wang (2006) to assign the excess cash for each firm. For each year, I conduct the average change in cash for each of the 25 Fama and French benchmark portfolios and subtract the results from each firm's realized change in cash. According to Tong (2011), this method also reduces the impact of the time trend. All the robust tests show similar results to the main tests. Moreover, most of the coefficients are significant similarly to the main tests' coefficients.

Table 7 presents the results of the robustness check for the marginal value of cash for the average firm during and after the financial crisis. The results are consistent with the main tests. However, the interaction term Financial Crisis * ΔExcess Cash Holdings loses its significance although it still shows a positive sign for the coefficient. The second regression shows a significant coefficient for the interaction term of After Financial Crisis and ΔExcess Cash Holdings indicating that after the crisis a dollar is valued 19.9 cents less than before the crisis.

Table 8 and 9 presents the results for robust tests for the constrained and unconstrained during and after the financial crisis, respectively. The results are consistent with my main tests. Table 8 indicates that during the crisis a financially constrained firm's excess dollar is valued at 58.4 cents less compared to unconstrained firm if grouped by size and if debt and level of cash holdings are ignored. The age group also presents a negative, although a more modest effect of the crisis to constrained firms. Table 9 also presents consistent results with the main tests. The triple interaction terms show significant positive coefficients indicating that the value of cash has increased for constrained firms after the crisis compared to unconstrained firms.

Table 7

This table presents the regression results for 2 different regressions. Columns 2 and 3 present the coefficients and p-values for the sample period 2001-2009 which examines the impacts of financial crisis to the marginal value of excess cash. Columns 4 and 5 present the coefficients and p-values for the sample periods 2001-2006 & 2010-2015. The first regression includes 1869 firms and 13119 firm-years and the second includes 2677 firms and 20671 firm-years. The dependent variable is Excess Return defined as $R_{i,t} - RB_{i,t}$. ΔExcess Cash Holdings is the 1-year realized change in cash and short-term investments minus the average 1-year change in cash of the average firm in the corresponding benchmark portfolio. Financial Crisis is a dummy variable that equals 1 if the observation dates between years 2007-2009 and 0 if the observation dates between years 2001-2006. After Financial Crisis is a dummy variable that equals 1 if the observation dates between 2010-2015 and 0 if the observation dates between years 2001-2006. All variables, except leverage and the dummy variables, are scaled by the 1-year lagged market value of equity. Details on the variables are presented in section 3.2 and Appendix. A P-value of 0,000 presents that the p-value is significant at 0,05 % or lower.

	I		II	
	Coef.	*P-value*	*Coef.*	*P-value*
Intercept	0,075	0,000	0,096	0,000
ΔExcess Cash Holdings	1,133	0,000	1,164	0,000
Financial Crisis	0,019	0,054		
Financial Crisis * ΔExcess Cash Holdings	0,074	0,229		
After Financial Crisis			-0,085	0,000
After Financial Crisis * ΔExcess Cash Holdings			-0,199	0,000
ΔEarnings	0,257	0,000	0,200	0,000
ΔNet Assets	0,117	0,000	0,109	0,000
ΔR&D	-0,452	0,000	0,092	0,357
ΔInterest Expenses	-0,711	0,000	-0,689	0,000
ΔDividends	-0,260	0,059	0,477	0,000
Leverage	-0,306	0,000	-0,291	0,000
Cash Holdings$_{t-1}$	0,371	0,000	0,224	0,000
New Financing	-0,124	0,000	-0,135	0,000
ΔExcess Cash Holdings * Cash Holdings$_{t-1}$	-0,202	0,000	-0,297	0,000
ΔExcess Cash Holdings * Leverage	-0,498	0,000	-0,531	0,000
Observations	16150		23703	
Adjusted R^2	0,130		0,094	

Table 8

This table presents the regression results for financially unconstrained and financially constrained firms before and during the financial crisis. Therefore, the sample period is 2001-2009. Columns 2 and 4 presents the coefficients and p-values if the firm is distinguished as constrained/unconstrained by the size of the firm. Columns 6 and 8 presents the respective values for constrained and unconstrained firms distinguished by the age of the firm. The dependent variable is Excess Return defined as $R_{i,t} - RB_{i,t}$. ΔExcess Cash Holdings is the 1-year realized change in cash and short-term investments minus the average 1-year change in cash of the average firm in the corresponding benchmark portfolio. Financial crisis is a dummy variable that equals 1 if the observation dates to or after 2007 and 0 if observation dates before 2007. The first regression includes 1321 firms and 7882 firm-years and the second includes 1407 firms and 8289 firm-years. All of the variables, except leverage and the dummy variables, are scaled by the 1-year lagged market value of equity. A P-value of 0,000 presents that the p-value is significant at 0,05 % or lower. More about the variables in sections 3.2 & 3.5 and Appendix A.

	Size		Age	
	Coef.	*P-value*	*Coef.*	*P-value*
Intercept	0,109	0,000	0,069	0,000
ΔExcess Cash Holdings	1,086	0,000	0,825	0,000
Financial Crisis	0,071	0,000	0,028	0,105
Constrained	-0,082	0,000	-0,013	0,389
Financial Crisis * Constrained	-0,063	0,016	0,020	0,411
Constrained * ΔExcess Cash Holdings	-0,011	0,937	0,304	0,009
Financial Crisis * Constrained * ΔExcess Cash Holdings	-0,573	0,002	-0,351	0,028
Financial Crisis * ΔExcess Cash Holdings	0,501	0,002	0,412	0,001
ΔEarnings	0,216	0,000	0,251	0,000
ΔNet Assets	0,113	0,000	0,115	0,000
ΔR&D	-0,430	0,001	-0,193	0,192
ΔInterest Expenses	-0,572	0,004	-0,362	0,071
ΔDividends	-0,245	0,197	-0,337	0,036
Leverage	-0,385	0,000	-0,311	0,000
Cash Holdings$_{t-1}$	0,458	0,000	0,369	0,000
New Financing	-0,083	0,013	-0,041	0,193
ΔExcess Cash Holdings * Cash Holdings$_{t-1}$	-0,117	0,034	-0,213	0,000
ΔExcess Cash Holdings * Leverage	-0,341	0,009	-0,341	0,012
Observations	7882		8289	
Adjusted R^2	0,130		0,130	

Table 9

This table presents the regression results for financially unconstrained and financially constrained firms during and after the financial crisis. Therefore, the sample period is 2007-2015. Columns 3 and 4 presents the coefficients and p-values if the firm is distinguished as constrained/unconstrained by the size of the firm. Columns 4 and 5 presents the respective values for constrained and unconstrained firms distinguished by the age of the firm. The dependent variable is Excess Return defined as $R_{i,t} - RB_{i,t}$. ΔExcess Cash Holdings is the 1-year realized change in cash and short-term investments minus the average 1-year change in cash of the average firm in the corresponding benchmark portfolio. After Financial crisis is a dummy variable that equals 1 if the observation dates to or after 2010 and 0 if observation dates before 2010. The first regression includes 1899 firms and 10596 firm-years and the second includes 2290 firms and 11138 firm-years. All of the variables, except leverage and the dummy variables, are scaled by the 1-year lagged market value of equity. Details on the variables are presented in section 3.2 and Appendix A. A P-value of 0,000 presents that the p-value is significant at 0,05 % or lower. More about the variables in section 3.2, section 3.5 and Appendix A.

	Size		Age	
	Coef.	*P-value*	*Coef.*	*P-value*
Intercept	0,211	0,000	0,128	0,000
ΔExcess Cash Holdings	1,675	0,000	1,270	0,000
After Financial Crisis	-0,163	0,000	-0,094	0,000
Constrained	-0,146	0,000	0,014	0,396
After Financial Crisis * Constrained	0,042	0,044	-0,048	0,017
Constrained * ΔExcess Cash Holdings	-0,733	0,000	-0,120	0,236
After Financial Crisis * Constrained * ΔExcess Cash Holdings	0,758	0,000	0,233	0,070
After Financial Crisis * ΔExcess Cash Holdings	-0,817	0,000	-0,494	0,000
ΔEarnings	0,194	0,000	0,191	0,000
ΔNet Assets	0,118	0,000	0,091	0,000
ΔR&D	-0,362	0,000	-0,300	0,013
ΔInterest Expenses	0,147	0,347	0,353	0,016
ΔDividends	0,038	0,753	0,000	0,999
Leverage	-0,473	0,000	-0,400	0,000
Cash Holdings$_{t-1}$	0,402	0,000	0,298	0,000
New Financing	-0,066	0,004	-0,056	0,012
ΔExcess Cash Holdings * Cash Holdings$_{t-1}$	-0,069	0,149	-0,111	0,016
ΔExcess Cash Holdings * Leverage	-0,702	0,000	-0,650	0,000
Observations	7882		8289	
Adjusted R^2	0,130		0,130	

6. Conclusion

This thesis has contributed to the existing literature by examining the marginal value of corporate cash for shareholders during and after the financial crisis (2007-2009) in the United States. Moreover, I have examined how the crisis and its aftermath have affected the marginal value of cash for financially constrained and unconstrained firms. Throughout the study, I have followed the methodology of Faulkender & Wang (2006) for my regressions.

Consistent with my first hypothesis, I find that the marginal value of cash has increased during the financial crisis of 2008. In my main test, I find that for a company with zero debt and no cash holdings, an extra dollar is worth 12,6 cents more during the crisis. For an average company, the value of cash has increased 4 cents. The reason why the increase for the average firm is not as large is the increased mean cash holdings and mean leverage which balances the crisis effects. I see the increase in the value of cash as a result of impaired access to capital markets, increase in short-term debt and the lower future expectations of income streams by shareholders leading them to place a premium to extra cash. After the financial crisis of 2008, the marginal of value of cash has since decreased below the levels of the period before the crisis. The regression results present a significant decrease of 19,3 cent after the crisis. I argument this to be the mostly due to the result of increase in abnormal cash holdings, decrease in value-creating investment opportunities and the declined competition in the United States. The robust tests indicate similar, although slightly more modest, results in the first two tests.

In this thesis, I have also presented that the marginal value of cash decreased for financially constrained firms during the financial crisis compared to unconstrained firms. However, after the crisis the value of an extra dollar for unconstrained firms has decreased whereas for constrained firms the value has increased. Additional tests with excess cash seem to present similar results. As Campello et al. (2010) emphasized, constrained firms had to at least postpone investment projects and cut on capital spending. Because of this the shareholders might have believed that an extra dollar is not going to be used to create value inside the company. Also, related to the previous reason, constrained firms are more vulnerable to distress. Combined with harder access to capital markets, larger portion of cash was believed to be used to cover debt and interest expense leading to a wealth transfer from shareholders to debtholders. However, the effects were only temporary and since the end of the financial crisis, the situation has standardized and the results after the crisis are similar to existing literature.

References

Almeida, H., Campello, M., & Weiscbach, M.S., (2004). The Cash Flow Sensitivity of Cash. *Journal of Finance,* 59*,* 1777–1804.

Acharya, V.V., Gujral, I., Kulkarni, N., & Shin, H.S., (2011). Dividends and Bank Capital in the Financial Crisis of 2007–2009. *The National Bureau of Economic Research.*

Bates, T.W., Kahle, K.M., & Stulz, R.M., (2009). Why Do U.S. Firms Hold So Much More Cash than They Used To? *The Journal of Financcce, 64*(5), 1985-2021.

Campello, M., Graham, J.R., & Harvey, C., R., (2010). The real effects of financial constrains: Evidence from a financial crisis. *Journal of Financial Economics.* 97(3), 470–487.

Carreira, C., & Silva, F., (2012). Where Are the Fragilities? The Relationship Between Firms' Financial Constraints, Size, And Age. *Managing Structural Changes, Trends and Requirements. 184–199.*

Denis, D.J., & Sibilkov, V., (2009). Financial Constraints, Investment, and the Value of Cash Holdings. *The Review of Financial Studies, 23(1),* 247-269.

Faulkender, M., & Wang, R., (2006). Corporate Financial Policy and the Value of Cash. *The Journal of Finance. 61(4),* 1957–1990.

Fosberg, R.H., (2013). Short-Term Debt Financing During the Financial Crisis. *International Journal of Business and Social Science, 4*(8).

Gutierrez, G., & Philippon, T., (2017). Declining competition and investments in the U.S. *NBER Working Paper 23583.*

Harford, J., Klasa, S., & Maxwell, W.F., (2013). Refinancing Risk and Cash Holdings. *The Journal of Finance, 69(3),* 975-1012.

Hadlock, C.J., & Pierce, J.R., (2010). New Evidence on Measuring Financial Constraints: Moving Beyond the KZ Index. *The Review of Financial Studies, 23*(5), 1909–1940.

Ivashina, V., & Scharfstein, D., (2010). Bank Lending During the Financial Crisis of 2008. *Journal of Financial Economics. 97*(3), 319 –338.

Kahle, K.M., & Stulz, R.M., (2013). Access to capital, investment, and the financial crisis. *Journal of Financial Economics, 110*(2), 280-299.

Kim, J., & Park, J.L., (2015). How do financial constraint and distress measure compare? *Investment Management and Financial Innovations, 12*(2), 41-50.

Pinkowitz, L.F., Stulz, R.M., & Williamson, R.G., (2013). Is there a U.S. High Cash Holdings Puzzle after the Financial Crisis? *Fisher College of Business Working Paper No. 2013-03-07; Georgetown McDonough School of Business Research Paper.*

Rehman, S.S., (1998). Financial Crisis Management in Regional Blocs.

Sánchez, J.M., & Yurdagul, E., (2013). Why Are Corporations Holding So Much Cash? *Regional Economist, January 2013.*

Shleifer, A., & Vishny, R.W., (2010) Unstable banking. *Journal of Financial Economics, 97*(39), 306-318.

Stockman, D., (2016). Chart Of The Day: Corporate Leverage Ratio Through The Roof. Retrieved from https://seekingalpha.com/article/3964071-chart-day-corporate-leverage-ratio-roof

Tong, Z., (2011). Firm Diversification and the Value of Corporate Cash Holdings. *Journal of Corporate Finance, 17*(3), 741-758.

Appendix A

Variable	Definition	Compustat keyset formula
$R_{i,t}$	Compounded 12-month stock return over fiscal year t-1 to t. CRSP item.	
$RB_{i,t}$	Benchmark return over fiscal year t-1 to t. Benchmark portfolio is assigned to each firm-year depending the intersection of size (log total assets) and book-to-market	
Total Assets		#6
Book value of equity	Common/Ordinary Equity- Total	#60
Excess Return	$R_{i,t}$-$RB_{i,t}$	
$MV_{i,t}$	Market value of equity at time t-1. Price Close Annual * Common Shares Outstanding	#199 * #25
Cash Holdings	Cash and Short-Term Investments	#1
Earnings	Earnings Before Extraordinary Items	#18 + #15 + #50 + #51
Net Assets	Total Assets minus Cash and Short-Term Investments	#6 - #1
R&D	Research and Development Expense	#46
Interest Expenses	Interest and Related Expense - Total	#15
Dividends	Dividends Common/Ordinary	#21
New Financing	Sale of Common and Preferred Stock - Purchase of Common and Preferred Stock + Long-Term Debt/Issuance - Long-Term Debt/Reduction	#108 - #115 + #111 - #114
Leverage	Long-Term Debt -Total /(Long-Term Debt-Total + $Mv_{i,t}$)	#9 / (#9+(#199 * #25))